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DIALOG(R)File 351:Derwent WPI

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Mfg. appts. for semiconductor device and liq. crystal display panel - has monitor which shows time difference of exceeded value of tolerable limit based on computed value of calculator determined by decision circuit

Patent Assignee: CANON KK (CANO)
Number of Countries: 001 Number of Patents: 002
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
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Abstract (Basic): JP 8161033 A

The appts. includes a quantity specification unit which specifies the quantity of the processed semiconductor wafers allotted for each batch. The information about the processing time for each batch is set up in a setter.

A calculator computes the time required to process each batch of processed semiconductor wafers. A decision circuit determines whether the computed value of the calculator is less than a tolerable limit. If the computed value exceeds the tolerable limit, the time difference is displayed in a monitor.

ADVANTAGE - Provides early diagnosis of defect during initial stage of processing.

Dwg.1/4

Title Terms: MANUFACTURE; APPARATUS; SEMICONDUCTOR; DEVICE; LIQUID; CRYSTAL ; DISPLAY; PANEL; MONITOR; SHOW; TIME; DIFFER; VALUE; TOLERATE; LIMIT; BASED; COMPUTATION; VALUE; CALCULATE; DETERMINE; DECIDE; CIRCUIT
Derwent Class: T06; U11
International Patent Class (Main): G05B-023/02; H01L-021/027
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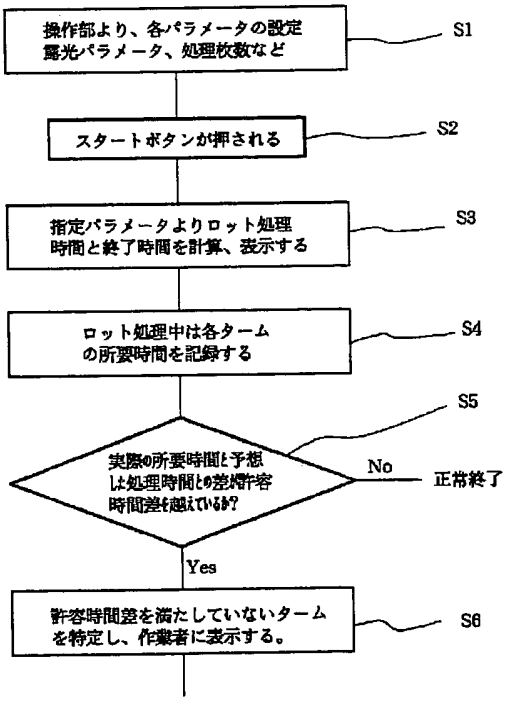
(54)【発明の名称】　デバイス製造装置および方法

(57)【要約】

【目的】　ロット処理工程または装置を自己診断しその不具合を早期発見する。

【構成】　ロット処理の開始前に処理すべき１ロットの被処理物の数量を指定し、ロット処理の各部分的処理に要する処理時間の情報を設定し（Ｓ１，Ｓ２）、これらの数量および情報に基づいてそのロット処理に要する時間またはその処理の終了時刻を算出して（Ｓ３）おき、前記ロット処理の終了後、算出された時間または時刻と実際のロット処理時間または終了時刻との時間差が許容範囲内であるか否かを判定し（Ｓ４，Ｓ５）、前記時間差が許容範囲以内でなかった場合はそのロット処理に不具合があったものと判定する。



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【特許請求の範囲】

【請求項１】　ロット処理すべき１ロットの被処理物の数量を指定する数量指定手段と、前記ロット処理の各部分的処理に要する処理時間の情報を設定する設定手段と、前記指定手段により指定された被処理物数量および前記設定手段により設定された処理時間情報に基づいて前記ロット処理に要する時間またはその処理の終了時刻を算出する算出手段と、前記ロット処理の終了後、前記算出手段によって算出された値と実際のロット処理時間または終了時刻との時間差が許容範囲以内であるか否かを判定する手段と、許容範囲を超える場合、それを表示する表示手段とを具備することを特徴とするデバイス製造装置。

【請求項２】　前記各部分的処理ごとにその処理に要する処理時間と実際の処理時間との差が許容範囲以内であるか否かを判定する手段と、差が許容範囲以内でない部分的処理を表示する手段とをさらに具備する請求項１記載の装置。

【請求項３】　前記ロット処理における時間差が前記許容範囲以内でなかったときのみ、前記各部分的処理ごとの処理予測時間と実際の処理時間との差が許容範囲以内であるか否かの判定、および差が許容範囲以内でない部分的処理の表示を行なう請求項２記載の装置。

【請求項４】　前記デバイス製造装置が、前記ロット処理として１ロットのウエハを露光する半導体露光装置である請求項１～３のいずれかに記載の装置。

【請求項５】　前記設定手段は前記露光処理の種類に応じた前記処理時間情報を記憶している記憶手段と、その露光処理の種類を指定する種類指定手段と、これによって入力された種類に対応する露光処理の処理時間情報を前記記憶手段から読み出す読出手段とを備えることを特徴とする請求項４記載の装置。

【請求項６】　前記表示手段が前記１ロットの露光処理のスタート時に前記時間または時刻を表示することを特徴とする請求項４または５に記載の装置。

【請求項７】　前記枚数指定手段および設定手段は露光処理とは無関係にいつでも操作可能であり、これらが操作されたとき前記算出手段および表示手段はその処理を行なうものであることを特徴とする請求項４または５に記載の装置。

【請求項８】　ロット処理の開始前に処理すべき１ロットの被処理物の数量を指定するステップと、前記ロット処理の各部分的処理に要する処理時間の情報を設定するステップと、指定された被処理物数量および設定された処理時間情報に基づいて前記ロット処理に要する時間またはその処理の終了時刻を算出するステップと、前記ロット処理の終了後、前記ステップで算出された値と実際のロット処理時間または終了時刻との時間差が許容範囲以内であるかを判定するステップとを具備し、前記時間差が許容範囲以内でなかったことに基づいて前記ロット処理に不具合があったことを判定することを特徴とするデバイス製造方法。

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【請求項９】　前記ロット処理における時間差が前記許容範囲以内でなかった場合、前記各部分的処理ごとにその処理に要する処理時間と実際の処理時間との差が許容範囲以内であるか否かを判定するステップをさらに具備する請求項８記載の方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、半導体装置やＬＣＤパネル等のデバイスを製造するための装置および方法に関し、特にロット単位での処理時間または終了時刻を算出し、これと実際に要した処理時間または終了時刻との差に基づいて装置または製造工程の自己診断を行なうようにしたデバイス製造装置および方法に関する。

【０００２】

【従来の技術】半導体ウエハ上に回路パターンを焼き付ける半導体露光装置、例えばステッパは、多数のウエハをロット単位で処理する。このとき、ロットにより露光条件、アライメント条件等が異なる。従来、このロット単位の処理時間および処理終了時刻は、それまでの経験等から作業者が予測している。また、このロット処理時間または処理終了時刻と実際の処理時間または処理終了時刻との差が著しく大きかった場合、作業者は装置に異常があると判断し点検を行なっていた。

【０００３】しかしながら、この処理時間および処理終了時刻は露光パラメータ、ステッパの内部パラメータ等により変化するので、作業者が正確な処理時間および処理終了時刻を予測するのは困難である。特に、多品種少量生産のラインや、新製品の試作ライン等では、１台の露光装置に色々なロットを流すので、前述のような問題点が起きることが多い。また、予測した処理時間または処理終了時刻と実際の処理時間または処理終了時刻との差が大きかった場合でも、ロットの処理のどこでその差が発生しているか作業者は判断することができなかった。

【０００４】なお、本出願人は、作業者が正確な処理時間および処理終了時刻を予測するのが困難である点に鑑み、先に、露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段と、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段と、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段と、これによって算出された値を表示する表示手段とを具備することにより、作業者が容易に処理時間および処理終了時刻を把握できるようにした半導体露光装置を特願平６－２９７１６４として出願している。

【０００５】

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【発明が解決しようとする課題】本発明は上記事情を考慮したもので、ロット処理工程またはロット処理用の装置において、処理工程または装置の動作を自己診断しその不具合を早期発見することを目的とする。

【0006】

【課題を解決するための手段】上記の目的を達成するため本発明では、ロット処理の開始前にそのロット処理で処理すべき1ロットの被処理物の数量を指定し、該ロット処理の各部分的処理に要する処理時間の情報を設定して、これらの指定された被処理物数量および設定された処理時間情報に基づいてそのロット処理に要する時間またはそのロット処理の終了時刻を算出しておく。そして、ロット処理の終了後に、算出された処理時間または終了時刻と実際の時間または時刻との差が一定許容値内に収まっているかを判定し、一定許容値内に収まっていない場合、そのロット処理に不具合があったものと判定することを特徴としている。また、前記ロット処理に不具合があった場合等、必要に応じてそのロット処理を構成する各部分的処理ごとにその実際の処理時間と予め設定または算出された処理時間とを比較し、差が許容範囲を超えている部分的処理を不具合箇所として特定することを特徴としている。

【0007】

【作用】上記構成によれば、ロット処理の開始前にそのロット処理の各部分的処理に要する処理時間の情報を設定し、そのロット処理で処理すべき1ロットの被処理物の数量を指定することによってそのロット処理に要する時間またはそのロット処理の終了時刻を算出することができ、作業者等が正確な処理時間および処理の終了時刻を容易に知ることができる。

【0008】そして、ロット処理の終了後に、算出された処理時間または終了時刻と実際の時間または時刻との時間差を求めその時間差が一定許容値内に収まっていない場合をそのロット処理に不具合があったものと判定することにより、経験を積まない作業者であっても容易にロット処理の良否を判断することができる。さらに、そのロット処理を構成する各部分的処理ごとにその実際の処理時間と予め設定または算出された処理時間とを比較し、差が許容範囲を超えている部分的処理を検索することにより、不具合箇所である部分的処理を容易に特定することができる。

【0009】本発明の好ましい実施例において、上記の構成は例えば半導体露光装置に適用される。この半導体露光装置は、露光処理を行なう1ロットのウエハの枚数を指定する枚数指定手段と、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段と、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記1ロットの露光処理に要する時間またはその処理の終了時刻を算出する算出手段と、前記露光処理の終了後、該露光処理に実際に要した処理時間または実際の露光処理終了時刻と前記算出手段によって算出された値との時間差を所定の許容時間と比較する比較手段と、前記時間差が所定の許容時間を超えた場合に、前記各部分的処理ごとにその処理予測時間と実際の処理時間との差を求め、それを所定の許容値と比較して処理の不具合であった部分的処理を特定する不具合箇所特定手段と、前記不具合箇所を表示する　表示手段とを具備する。

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【0010】前記設定手段は露光処理の種類に応じた前記処理時間情報を記憶している記憶手段と、その露光処理の種類を指定する種類指定手段と、これによって入力された種類に対応する露光処理の処理時間情報を前記記憶手段から読み出す読出手段とを備える。前記算出手段は、指定された露光パラメータ、ステッパ内部パラメータ、および処理ウエハ枚数等の情報とこれらの情報に応じて前記記憶手段から読み出される処理時間情報に基づいてロットの処理予測時間および終了予測時刻を算出する。前記表示手段は前記1ロットの露光処理のスタート時に前記時間または時刻を表示する。

【0011】露光装置を用いて露光処理を行なう際等において、1ロットの露光処理に要する時間もしくはその処理の終了時刻を表示させるためには、枚数指定手段により1ロットの処理ウエハの枚数を指定し、また設定手段により処理時間情報を設定する。この処理時間情報は、露光時間やステップ回数等の露光パラメータやステッパ内部パラメータであり、通常、露光条件の異なるロットによって異なる。したがって処理時間情報の設定は具体的には例えば、そのロットに適用する露光の種類をジョブ名等として種類指定手段によって指定し、指定されたジョブ名に対応する処理時間情報を記憶手段から読み出すことにより行なわれる。算出手段はそれらのウエハ枚数および処理時間情報に基づいて1ロットの露光処理に要する時間（処理予測時間）もしくはその処理の終了時刻（終了予測時刻）を算出し、その値を表示手段が表示する。表示された処理予測時間や終了予測時刻は、容易に作業者によって認識され、装置の効率的な運用に供される。

【0012】1ロットの露光処理の終了後、比較手段は、前記算出手段で求めた処理予測時間または終了予測時刻と実際の処理時間または終了時刻との時間差が所定の許容差に収まっているかどうかの判断を行なう。不具合箇所特定手段は、前記比較手段が収まっていないと判断した場合、その時間差がどこで発生しているかを調べ、その箇所を特定し表示手段に表示させる。作業者は、露光処理終了後の表示より、露光処理における不具合の有無および不具合が有った場合の不具合箇所の特定が容易にできる。

【0013】したがって、本発明は、製造ラインの製造装置や工程の不具合の早期発見および稼働率の向上という観点から、次のような効果を発揮する。

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①複数の装置で複数のロットを流す場合、各ロットの終了予測時刻と実際の終了時刻を管理することができるため、各装置または工程がその装置または工程本来のスループット性能を発揮しているかのチェックを行なうことができる。そのため、従来では見逃しがちであった、装置または工程の不具合の早期発見に寄与する。

②前述のチェックにおいて、その装置または工程が本来のスループット性能を発揮していない場合、ロットの処理でどの処理がスループット低下の要因となっているかを特定しオペレータに示すことができる。そのため、装置または工程の不具合箇所の特定が早くなり、装置または工程稼働率の向上に寄与する。オペレータのアシスト（キャリア交換等）が必要とならないように、装置運営の計画を容易に立てるのに利用される。

【００１４】

【実施例】以下、実施例を通じて本発明をより具体的に説明する。図１は本発明の一実施例に係る半導体露光装置の外観を示す斜視図である。同図に示すように、この半導体露光装置は、装置本体の環境温度制御を行なう温調チャンバ１０１、その内部に配置され、装置本体の制御を行うＣＰＵを有するＥＷＳ本体１０６、ならびに、装置における所定の情報を表示するＥＷＳ用ディスプレイ装置１０２、装置本体において撮像手段を介して得られる画像情報を表示するモニタＴＶ１０５、装置に対し所定の入力を行うための操作パネル１０３、ＥＷＳ用キーボード１０４等を含むコンソール部を備えている。図中、１０７はＯＮ－ＯＦＦスイッチ、１０８は非常停止スイッチ、１０９は各種スイッチ、マウス等、１１０はＬＡＮ通信ケーブル、１１１はコンソール機能からの発熱の排気ダクト、そして１１２はチャンバの排気装置である。半導体露光装置本体はチャンバ１０１の内部に設置される。

【００１５】ＥＷＳ用ディスプレイ１０２は、ＥＬ、プラズマ、液晶等の薄型フラットタイプのものであり、チャンバ１０１前面に納められ、ＬＡＮケーブル１１０によりＥＷＳ本体１０６と接続される。操作パネル１０３、キーボード１０４、モニタＴＶ１０５等もチャンバ１０１前面に設置し、チャンバ１０１前面から従来と同様のコンソール操作が行なえるようにしてある。

【００１６】図２は、図１の装置の内部構造を示す図である。同図においては、半導体露光装置としてのステッパが示されている。図中、２０２はレチクル、２０３はウエハであり、光源装置２０４から出た光束が照明光学系２０５を通ってレチクル２０２を照明するとき、投影レンズ２０６によりレチクル２０２上のパターンをウエハ２０３上の感光層に転写することができる。レチクル２０２はレチクル２０２を保持、移動するためのレチクルステージ２０７により支持されている。ウエハ２０３はウエハチャック２９１により真空吸着された状態で露光される。ウエハチャック２９１はウエハステージ２０

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９により各軸方向に移動可能である。レチクル２０２の上側にはレチクルの位置ずれ量を検出するためのレチクル光学系２８１が配置される。ウエハステージ２０９の上方に、投影レンズ２０６に隣接してオフアクシス顕微鏡２８２が配置されている。オフアクシス顕微鏡２８２は内部の基準マークとウエハ２０３上のアライメントマークとの相対位置検出を行なうのが主たる役割である。また、これらステッパ本体に隣接して周辺装置であるレチクルライブラリ２２０やウエハキャリアエレベータ２３０が配置され、必要なレチクルやウエハはレチクル搬送装置２２１およびウエハ搬送装置２３１によってステッパ本体に搬送される。

【００１７】チャンバ１０１は、主に空気の温度調節を行なう空調機室２１０および微小異物を濾過し清浄空気の均一な流れを形成するフィルタボックス２１３、また装置環境を外部と遮断するブース２１４で構成されている。チャンバ１０１内では、空調機室２１０内にある冷却器２１５および再熱ヒーター２１６により温度調節された空気が、送風機２１７によりエアフィルタｇを介してブース２１４内に供給される。このブース２１４に供給された空気はリターンロｒａより再度空調機室２１０に取り込まれチャンバ１０１内を循環する。通常、このチャンバ１０１は厳密には完全な循環系ではなく、ブース２１４内を常時陽圧に保つため循環空気量の約１割のブース２１４外の空気を空調機室２１０に設けられた外気導入口ｏａより送風機を介して導入している。このようにしてチャンバ１０１は本装置の置かれる環境温度を一定に保ち、かつ空気を清浄に保つことを可能にしている。また光源装置２０４には超高圧水銀灯の冷却やレーザ異常時の有毒ガス発生に備えて吸気口ｓａと排気口ｅａが設けられ、ブース２１４内の空気の一部が光源装置２０４を経由し、空調機室２１０に備えられた専用の排気ファンを介して工場設備に強制排気されている。また、空気中の化学物質を除去するための化学吸着フィルタｃｆを、空調機室２１０の外気導入口ｏａおよびリターンロｒａにそれぞれ接続して備えている。

【００１８】図３は、図１の装置の電気回路構成を示すブロック図である。同図において、３２１は装置全体の制御を司る、前記ＥＷＳ本体１０６に内蔵された本体ＣＰＵであり、マイクロコンピュータまたはミニコンピュータ等の中央演算処理装置からなる。３２２はウエハステージ駆動装置、３２３は前記オフアクシス顕微鏡２８２等のアライメント検出系、３２４はレチクルステージ駆動装置、３２５は前記光源装置２０４等の照明系、３２６はシャッタ駆動装置、３２７はフォーカス検出系、３２８はＺ駆動装置であり、これらは、本体ＣＰＵ３２１により制御される。３２９は前記レチクル搬送装置２２１、ウエハ搬送装置２３１等の搬送系である。３３０はコンソールユニットであり、前記ディスプレイ１０２、本体ＣＰＵ３２１にこの露光装置の動作に関する各

種のコマンドやパラメータを与えるための操作パネル１０３、キーボード１０４および不図示のマウス、ならびに露光処理の開始を指令するための図示しないスタートボタン等を有する。すなわち、コンソールユニット３３０は、オペレータとの間で情報の授受を行うためのものであり、かつ本発明の特徴とする、露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段、および、これによって算出された値を表示する表示手段を構成する。

【００１９】３３１はコンソールＣＰＵ、３３２はパラメータ等を記憶する外部メモリである。外部メモリ３３１は例えばハードディスクであり、露光に必要なデータや露光処理の種類に応じた各部分的処理ごとの処理時間情報をジョブファイルとして記憶している。

【００２０】図４はこの装置の動作を示すフローチャートである。１ロットの露光処理を行なう場合、オペレータは、図４に示すように、コンソールユニット３３０の操作部（操作パネル、キーボード１０４、図示しないマウス等）によりまずそのロットの処理に適用するジョブファイルを指定し、そのロットで処理するウエハ枚数を指定して、しかる後に前記スタートボタンを押す。

【００２１】するとコンソールＣＰＵ３３１は、指定されたジョブファイルに記憶されている各種パラメータ、およびステッパ内部の必要パラメータを読み出し、次の式によってロットの処理時間（Ｅｔ）を計算する。

処理時間（Ｅｔ）＝ウエハ枚数（Ｗ）×インデックスタイム（Ｉｔ）

前記インデックスタイム（Ｉｔ）は次式によって求められる。

Ｉｔ＝Ｔｗｌ＋Ｔｐｌ＋Ｔａｌ＋（Ｔｅｌ＋（Ｔｘｙｌ＋Ｔｆｌ）×Ｎｓ）×Ｎｅ

但し、Ｔｗｌ：ウエハ交換時間

Ｔｐｌ：プリアライメント時間

Ｔａｌ：アライメント時間

Ｔｅｌ：露光時間

Ｔｘｙｌ：ステージ駆動時間

Ｔｆｌ：フォーカス時間

Ｎｓ：ステップ回数

Ｎｅ：露光ショット数

さらに、前記アライメント時間Ｔａｌは次の式により求められる。

アライメント時間（Ｔａｌ）＝（Ｔａｓｌ＋Ｔａｘｙｌ）×Ｎａ

但し、Ｔａｓｌ：アライメント計測時間

Ｔａｘｙｌ：ステージ駆動時間

Ｎａ：アライメントのための計測ショット数

以下、前記ウエハ交換やプリアライメント等の個々の動作（部分的処理）をタームと称することとする。

【００２２】処理時間（Ｅｔ）を計算すると、コンソールＣＰＵ３３１は、次に、前記スタートボタンが押された時刻と処理時間（Ｅｔ）とから終了予測時刻（ＥＴ）を計算し、ディスプレイ１０２上に表示する。このとき、ウエハ搬送系にインライン搬送系を含むものを想定すれば、ウエハ交換時間Ｔｗｌを補正することも可能である。終了予測時刻（ＥＴ）を表示するとロット処理を開始し、ロット処理中は各タームに要した時間を記録する。

【００２３】ロット処理を終了すると、コンソールＣＰＵ３３１は、実際の処理時間（Ｒｔ）と予測した処理時間（Ｅｔ）との時間差（Ｄｔ）を求め、その時間差が所定の許容時間差（Ｄａ）以内であったか否かの判断を行なう。ここで、許容時間差（Ｄａ）は、各タームごとの許容時間を設定し、次の式のように、それらを基に算出される。

Ｄｔ＝Ｄｗｌ＋Ｄｐｌ＋Ｄａｌ＋（Ｄｅｌ＋（Ｄｘｙｌ＋Ｄｆｌ）×Ｎｓ）×Ｎｅ

但し、Ｄｗｌ：ウエハ交換許容時間

Ｄｐｌ：プリアライメント許容時間

Ｄａｌ：アライメント許容時間

Ｄｅｌ：露光許容時間

Ｄｘｙｌ：ステージ駆動許容時間

Ｄｆｌ：フォーカス許容時間

Ｎｓ：ステップ回数

Ｎｅ：露光ショット数

アライメント許容時間差（Ｄａｌ）＝（Ｄａｓｌ＋Ｄａｘｙｌ）×Ｎａ

但し、Ｄａｓｌ：アライメント計測許容時間

Ｄａｘｙｌ：ステージ駆動許容時間

Ｎａ：アライメントのための計測ショット数

【００２４】ここで、実際にかかった処理時間（Ｒｔ）と処理予測時間（Ｅｔ）との差が前記許容時間差（Ｄａ）より大きかった場合、つまり

｜Ｒｔ－Ｅｔ｜＞Ｄａ

であった場合には、各タームごとにその処理予測時間と実際にかかった処理時間との時間差を求め、その時間差がそのタームの許容時間差以内でなかったタームを特定しディスプレイ１０２に表示する。オペレータは、この表示をもとに装置が本来持っているスループット特性を発揮しているか否かを知ることができるとともに、発揮していない場合は、特定されたタームをもとに不具合要因の所在箇所を把握することができる。

【００２５】

【発明の適用範囲】なお、上述の実施例においては、不具合の有無を判定するため処理予測時間と実際にかかった処理時間との時間差を求めるようにしているが、終了予測時刻と実際の終了時刻との時間差を求めるようにしてもよい。

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【００２６】また、上述の実施例においては、ウエハ枚数の指定および処理時間の設定を行なってスタートボタンを押した後、処理予測時間等の算出および表示を開始するようにしているが、処理物数量の指定および処理時間の設定は露光処理とは無関係にいつでも操作可能にし、これらが操作されたとき前記算出手段および表示手段はその処理を行なうようにしてもよい。さらに前記予測時間または時刻の表示を任意のときに行なわせるための指令手段を設けてもよい。

【００２７】さらに、上述においては、本発明を主に半導体を製造するための露光装置に適用した例を示したが、本発明は、ＬＣＤパネルを製造するための露光装置あるいは露光装置以外の半導体製造装置等のデバイス製造装置、さらにはこれら半導体やＬＣＤパネル等のデバイスを製造するための製造ラインまたは処理工程に適用してもよい。

【００２８】

【発明の効果】以上のように本発明は、ロット処理スタート時に予測したロット処理時間または終了予測時刻と実際に要した処理時間または実際の終了時刻との時間差により、装置や処理工程が本来持っているスループット特性を発揮しているか否かを診断し、装置または処理工程が本来持っているスループット特性を発揮していなかった場合、どのターム（または部分的処理）が許容時間を満たしていないか診断し、不具合要因を特定することにより、装置や処理工程の不具合の早期発見と不具合からの早期復旧に寄与するという効果を有する。

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【図面の簡単な説明】

【図１】　本発明の一実施例に係る半導体露光装置の外観を示す斜視図である。

【図２】　図１の装置の内部構造を示す図である。

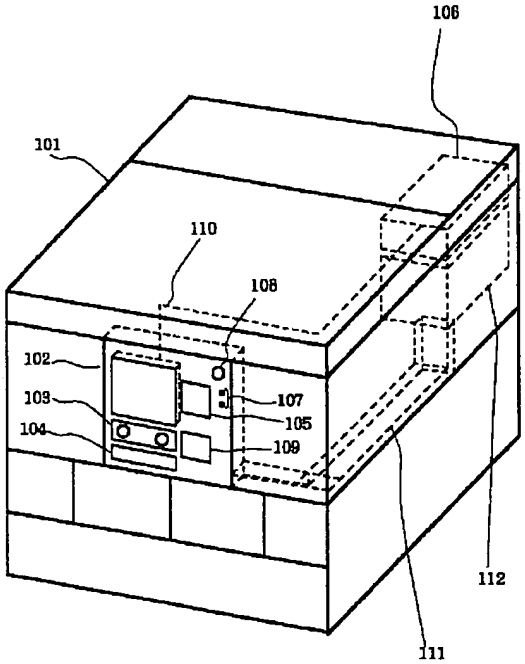
【図３】　図１の装置の電気回路構成を示すブロック図である。

【図４】　図１の装置の動作を示すフローチャートである。

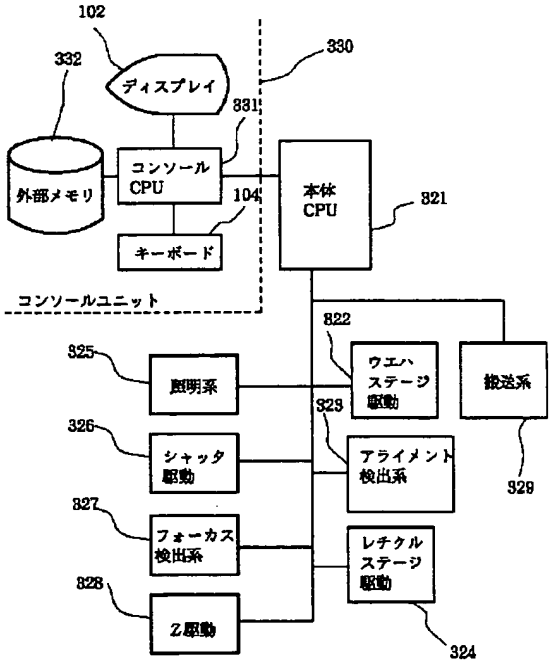
【符号の説明】

１０１：温調チャンバ、１０２：ＥＷＳ用ディスプレイ装置、１０３：操作パネル、１０４：ＥＷＳ用キーボード、１０５：モニタＴＶ、１０６：ＥＷＳ本体、１０７：ＯＮ－ＯＦＦスイッチ、１０８：非常停止スイッチ、１０９：各種スイッチ、マウス等、１１０：ＬＡＮ通信ケーブル、１１１：排気ダクト、１１２：排気装置、２０２：レチクル、２０３：ウエハ、２０４：光源装置、２０５：照明光学系、２０６：投影レンズ、２０７：レチクルステージ、２０９：ウエハステージ、２８１：レチクル顕微鏡、２８２：オフアクシス顕微鏡、２１０：空調機室、２１３：フィルタボックス、２１４：ブース、２１７：送風機、ｇ：エアフィルタ、ｃｆ：化学吸着フィルタ、ｏａ：外気導入口、ｒａ：リターン口、３２１：本体ＣＰＵ、３３０：コンソール、３３１：コンソールＣＰＵ、３３２：外部メモリ。

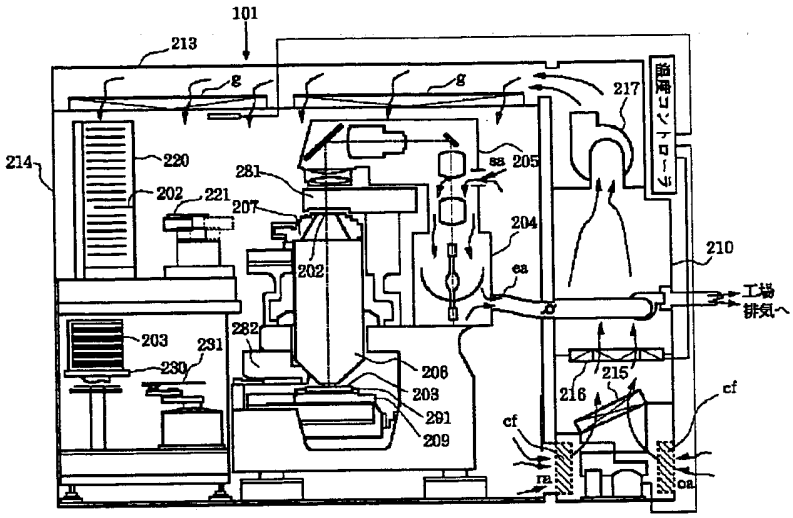
【図１】



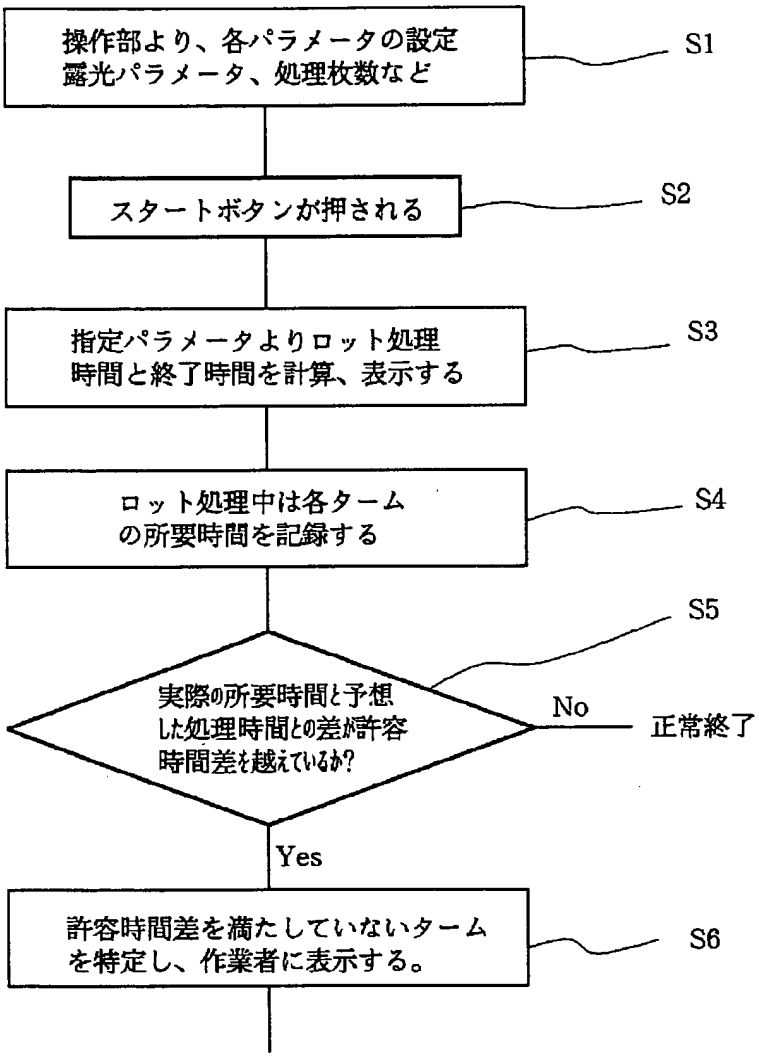
【図３】



【図２】


101
213
214
220
202
221
207
281
205
204
210
217
202
203
231
230
282
206
208
203
291
209
215
216
cf
cf
ra
oa
工場
排気

【図4】


操作部より、各パラメータの設定
露光パラメータ、処理枚数など
S1
スタートボタンが押される
S2
指定パラメータよりロット処理
時間と終了時間を計算、表示する
S3
ロット処理中は各ターム
の所要時間を記録する
S4
S5
実際の所要時間と予想
した処理時間との差が許容
時間差を越えているか?
No
正常終了
Yes
許容時間差を満たしていないターム
を特定し、作業者に表示する。
S6

CLAIMS

[Claim(s)]
[Claim 1] A quantity assignment means to specify the quantity of the processed material of one lot which should carry out lot processing, A setting means to set up the information on the processing time which each partial processing of said lot processing takes, A calculation means to compute the time amount which said lot processing takes based on the processing-time information set up by the processed material quantity specified by said assignment means, and said setting means, or the end time of the processing, The device manufacturing installation characterized by providing a means to judge whether time difference with the value computed by said calculation means after termination of said lot processing, the actual lot processing time, or end time is less than tolerance, and a display means to display it when exceeding tolerance.
[Claim 2] Equipment according to claim 1 which possesses further a means to judge whether the difference of the processing time which the processing takes for said every partial processing, and the actual processing time is less than tolerance, and a means to display the partial processing whose difference is not less than tolerance.
[Claim 3] Equipment according to claim 2 which displays judgment of whether the difference of the processing prediction time amount for said every partial processing and the actual processing time is less than tolerance only when the time difference in said lot processing is not said less than tolerance, and partial processing whose difference is not less than tolerance.
[Claim 4] Equipment according to claim 1 to 3 said whose device manufacturing installation is a semi-conductor aligner which exposes the wafer of one lot as said lot processing.
[Claim 5] Said setting means is equipment according to claim 4 characterized by to have a storage means to by_which said processing-time information according to the class of said exposure processing has been memorized, a class assignment means specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means.
[Claim 6] Equipment according to claim 4 or 5 characterized by displaying said time amount or time of day at the time of the start of said display means' exposure processing of said one lot.
[Claim 7] It is equipment according to claim 4 or 5 characterized by said calculation means and a display means being what performs the processing when it is independently operational in exposure processing always and, as for said number-of-sheets assignment means and a setting means, these are operated.
[Claim 8] The step which specifies the quantity of the processed material of one lot which should be processed before initiation of lot processing, The step which sets up the information on the processing time which each partial processing of said lot processing takes, The step which computes the time amount which said lot processing takes based on the specified processed material quantity and the set-up processing-time information, or the end time of the processing, The step which judges whether time difference with the value computed at said step, the actual lot processing time, or end time is less than tolerance is provided after termination of said lot processing. The device manufacture approach characterized by judging that fault was in said lot processing based on said time difference having not been less than tolerance.
[Claim 9] The method according to claim 8 of providing further the step which judges whether the difference of the processing time which the processing takes for said every partial processing, and the actual processing time is less than tolerance when the time difference in said lot processing is not said less than tolerance.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] About the equipment and the approach for manufacturing devices, such as a semiconductor device and the LCD panel, this invention computes especially the processing time or end time in a lot unit, and relates to the device manufacturing installation and approach of having been made to perform the self-test of equipment or a production process based on the difference with this, the actually required processing time, or end time.
[0002]
[Description of the Prior Art] The semi-conductor aligner which can be burned in a circuit pattern on a semi-conductor wafer, for example, a stepper, processes many wafers by the lot unit. At this time, exposure conditions, alignment conditions, etc. change with lots. Conventionally, the operator predicts the processing time and processing end time of this lot unit from the experience till then etc. Moreover, when a difference with this lot processing time, processing end time and the actual processing time, or processing end time was remarkable and large, the operator was checking by judging that abnormalities are in equipment.
[0003] However, since this processing time and processing end time change with an exposure parameter, the internal parameters of a stepper, etc., it is difficult for an operator to predict the exact processing time and processing end time. Especially, in Rhine of limited production with a wide variety, and prototype Rhine of a new product, since various lots are poured to one set of an aligner, the above troubles occur in many cases. Moreover, even when a difference with the predicted processing time, processing end time and the actual processing time, or processing end time was large, the difference had occurred where of processing of a lot, or the operator was not able to judge.
[0004] In addition, a number-of-sheets assignment means by which that these people predict the processing time with an exact operator and processing end time specifies the number of sheets of the wafer of one lot which performs exposure processing previously in view of a difficult point, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing, By providing a display means to display the value computed by this, the operator has applied for the semi-conductor aligner which enabled it to grasp the processing time and processing end time easily as Japanese Patent Application No. 6-297164.
[0005]
[Problem(s) to be Solved by the Invention] This invention is a thing in consideration of the above-mentioned situation, and it aims at carrying out early detection of the fault of self-test Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. for actuation of down stream processing or equipment in the equipment for lot down stream processing or lot processing.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, in this invention, the end time of the time amount which the lot processing takes based on such specified processed material quantity and set-up processing-time information, or its lot processing computes by specifying the quantity of the processed material of one lot which should be processed by the lot processing before initiation of lot processing, and setting up the information on the processing time which each partial processing of this lot processing takes. And when it judges whether the difference with the computed processing time, end time and actual time amount, or time of day is settled in the fixed allowed value and settled in the fixed allowed value after termination of lot processing, it is characterized by judging with what had fault in the lot processing. Moreover, when fault is in said lot processing, it is characterized by specifying the partial processing to which the actual processing time is compared with the processing time set up or computed beforehand, and the difference has exceeded tolerance for each [which constitutes the lot processing if needed] the partial processing of every as a fault part.
[0007]
[Function] According to the above-mentioned configuration, the information on the processing time which each partial processing of the lot processing takes can be set up before initiation of lot processing, the end time of the time amount which the lot processing takes by specifying the quantity of the processed material of one lot which should be processed by the lot processing, or its lot processing can be computed, and an operator etc. can know easily the exact processing time and the end time of processing.
[0008] And by judging the case where the time difference is not settled in the fixed allowed value after termination of lot processing in quest of time difference with the computed processing time, end time and actual time amount, or time

of day to be what had fault in the lot processing, even if it is the operator who does not gain experience, the quality of lot processing can be judged easily. Furthermore, the partial processing which is a fault part can be easily specified by searching the partial processing to which the actual processing time is compared with the processing time set up or computed beforehand, and the difference has exceeded tolerance for each [which constitutes the lot processing] the partial processing of every.

[0009] In the desirable example of this invention, the above-mentioned configuration is applied to for example, a semi-conductor aligner. A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot with which this semi-conductor aligner performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing, A comparison means [predetermined allowed time / time difference / of the processing time or the actual exposure processing end time which this exposure processing actually took after termination of said exposure processing, and the value computed by said calculation means], A fault part specification means to search for the difference of the processing prediction time amount and the actual processing time for said every partial processing, and to specify the partial processing which was the fault of processing about it as compared with the predetermined allowed value when said time difference exceeds predetermined allowed time, Said fault part is displayed. A display means is provided.

[0010] Said setting means is equipped with a storage means by which said processing-time information according to the class of exposure processing is memorized, a class assignment means to specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means. Said calculation means computes the processing prediction time amount and termination prediction time of day of a lot based on the processing-time information read from said storage means according to information and such information, such as a specified exposure parameter, an interior parameter of a stepper, and processing wafer number of sheets. Said display means displays said time amount or time of day at the time of the start of exposure processing of said one lot.

[0011] In case exposure processing is performed using an aligner, in order to display the time amount which exposure processing of one lot takes, or the end time of the processing, the number of sheets of the processing wafer of one lot is specified with a number-of-sheets assignment means, and processing-time information is set up with a setting means. This processing-time information is exposure parameters and the interior parameters of a stepper, such as the exposure time and a count of a step, and usually changes with lots with which exposure conditions differ. Therefore, by making into a job name etc. the class of exposure specifically applied to the lot, a setup of processing-time information is specified with a class assignment means, and is performed by reading the processing-time information corresponding to the specified job name from a storage means. A calculation means computes the time amount (processing prediction time amount) which exposure processing of one lot takes based on those wafer number of sheets and processing-time information, or the end time (termination prediction time of day) of the processing, and a display means displays the value. The processing prediction time amount and termination prediction time of day which were displayed are easily recognized by the operator, and efficient employment of equipment is presented with them.

[0012] A comparison means judges whether time difference with the processing prediction time amount found with said calculation means, termination prediction time of day and the actual processing time, or end time is settled in predetermined tolerance after termination of exposure processing of one lot. When it is judged that said comparison means is not settled, a fault part specification means investigates where the time difference has occurred, pinpoints the part, and is made to display it on a display means. An operator can do easily pinpointing of a fault part when there are the existence of fault and fault in exposure processing from the display after exposure processing termination.

[0013] Therefore, this invention demonstrates the following effectiveness from a viewpoint of the early detection of the manufacturing installation of a production line, or the fault of a process, and improvement in an operating ratio.

** Since the termination prediction time of day of each lot and actual end time can be managed when pouring two or more lots with two or more equipments, each equipment or a process can confirm whether to demonstrate the equipment or the throughput engine performance of process original. Therefore, in the former, it contributes to the early detection of the fault of the equipment or the process which tended to be overlooked.

** In the above-mentioned check, when the equipment or process does not demonstrate the original throughput engine performance, it can specify which processing causes a throughput fall by processing of a lot, and it can be shown to an operator. Therefore, pinpointing of equipment or the fault part of a process becomes early, and contributes to improvement in equipment or a process operating ratio. It is used for forming the plan of equipment management easily so that assistance (carrier exchange etc.) of an operator may not be needed.

.[0014]
[Example] Hereafter, this invention is more concretely explained through an example. Drawing 1 is the perspective view showing the appearance of the semi-conductor aligner concerning one example of this invention. As shown in this drawing, this semi-conductor aligner is arranged to the temperature control chamber 101 which performs environmental temperature control of the body of equipment, and its interior. In the EWS body 106 and row which have CPU which controls the body of equipment In the display unit 102 for EWS and the body of equipment which display the predetermined information in equipment It has the console section containing the control panel 103 for performing a predetermined input to the monitor TV 105 which displays the image information obtained through an image pick-up means, and equipment, and the keyboard 104 grade for EWS. For an emergency stop switch and 109, as for a LAN telecommunication cable and 111, 110, such as various switches and a mouse, is [107 / an ON-OFF switch and 108 / the jet pipe of generation of heat from a console function and 112] the exhausters of a chamber among drawing. The body of a semi-conductor aligner is installed in the interior of a chamber 101.
[0015] The display 102 for EWS is a thing thin flat type [, such as EL, plasma, and liquid crystal,], is dedicated to chamber 101 front face, and is connected with the EWS body 106 by the LAN cable 110. A control panel 103, a keyboard 104, and monitor TV105 grade are also installed in chamber 101 front face, and enable it to have performed the same console actuation as usual from chamber 101 front face.
[0016] Drawing 2 is drawing showing the internal structure of the equipment of drawing 1 . The stepper as a semi-conductor aligner is shown in this drawing. Among drawing, a reticle and 203 are wafers, and 202 can imprint the pattern on a reticle 202 in the sensitization layer on a wafer 203 with the projection lens 206, when the flux of light which came out of light equipment 204 illuminates a reticle 202 through the illumination-light study system 205. The reticle 202 is supported by the reticle stage 207 for holding a reticle 202 and moving. A wafer 203 is exposed after vacuum adsorption has been carried out by the wafer chuck 291. The wafer chuck 291 is movable to each shaft orientations by the wafer stage 209. The reticle optical system 281 for detecting the amount of location gaps of a reticle is arranged at the reticle 202 bottom. The projection lens 206 is adjoined above the wafer stage 209, and the off axis microscope 282 is arranged. It is a main role that the off axis microscope 282 performs relative-position detection with an internal reference mark and the alignment mark on a wafer 203. Moreover, these stepper body is adjoined, the reticle library 220 and the wafer carrier elevator 230 which are a peripheral device are arranged, and a required reticle and a required wafer are conveyed by the reticle transport device 221 and the wafer transport device 231 at a stepper body.
[0017] The chamber 101 consists of a filter box 213 which filters the air-conditioning cabin 210 and minute foreign matter which mainly perform temperature control of air, and forms the uniform flow of clarification air, and a booth 214 which intercepts an equipment environment with the exterior. Within a chamber 101, the air by which temperature control was carried out at the condensator 215 and the reheat heater 216 in the air-conditioning cabin 210 is supplied in a booth 214 through an air filter g by the blower 217. From the return opening ra, the air supplied to this booth 214 is incorporated again in the air-conditioning cabin 210, and circulates through the inside of a chamber 101. Usually, strictly, this chamber 101 has introduced the air outside the booth 214 of about ten percent of circulating air volume through a blower from the open air inlet oa in which it was prepared in the air-conditioning cabin 210 in order to always maintain the inside of not the perfect circulatory system but the booth 214 at positive pressure. Thus, it makes it possible for a chamber 101 to keep constant the environmental temperature on which this equipment is put, and to maintain air at clarification. Moreover, in preparation for cooling of an ultrahigh pressure mercury lamp, or toxic gas generating at the time of laser abnormalities, Inlet sa and an exhaust port ea are established in light equipment 204, and the forcible exhaust air of a part of air in a booth 214 is carried out via light equipment 204 at the plant through the ventilating fan of the dedication with which the air-conditioning cabin 210 was equipped. Moreover, it connected with the open air inlet oa and the return opening ra of the air-conditioning cabin 210, respectively, and they are equipped with the chemisorption filter cf for removing the chemical in air.
[0018] Drawing 3 is the block diagram showing the electrical circuit configuration of the equipment of drawing 1 . In this drawing, 321 is the body CPU which manages control of the whole equipment and which was built in said EWS body 106, and consists of arithmetic and program control, such as a microcomputer or a minicomputer. 322 -- for a reticle stage driving gear and 325, as for a shutter driving gear and 327, the illumination system of said light equipment 204 grade and 326 are [a wafer stage driving gear and 323 / the alignment detection system of said off axis microscope 282 grade, and 324 / a focal detection system and 328] Z driving gears, and these are controlled by the body CPU 321. 329 is the conveyance system of said reticle transport device 221 and wafer transport-device 231 grade. 330 is a console unit and has the start button which is not illustrated for ordering it the control panel 103 for giving various kinds of commands and parameters about actuation of this aligner to said display 102 and a body CPU 321, a keyboard 104, a non-illustrated mouse, and initiation of exposure processing. Namely, a console unit 330 is for delivering and

receiving information among operators. And a number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing by which it is characterized [of this invention], A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means and said setting means, or the end time of the processing, and a display means to display the value computed by this are constituted.
[0019] It is external memory 331 remembers Console CPU and 332 remembers a parameter etc. to be. It is a hard disk and external memory 331 has memorized the processing-time information for every partial processing according to data required for exposure, or the class of exposure processing as a job file.
[0020] Drawing 4 is a flow chart which shows actuation of this equipment. When performing exposure processing of one lot, as shown in drawing 4 , an operator specifies the job file first applied to processing of the lot by the control units (a control panel, a keyboard 104, mouse that is not illustrated) of a console unit 330, specifies the wafer number of sheets processed with the lot, and pushes said start button after an appropriate time.
[0021] Then, a console CPU 331 reads the various parameters memorized by the specified job file and the need parameter inside a stepper, and calculates the processing time (Et) of a lot by the following formula.
Processing time (Et) = wafer (number-of-sheets W) x index time (It)
Said index time (It) is called for by the degree type.
It =Twl+Tpl+Tal +(Tel+(Txyl+Tfl) xNs) xNe, however Twl:wafer swap time Tpl:PURIARAIMENTO Tal:alignment time amount Tel : exposure time Txyl : Stage drive time amount Tfl: Focal time amount Ns : Count Ne of a step : An exposure shots-per-hour pan is asked for said alignment time amount Tal by the following formula.
Alignment time amount (Tal)=(Tasl+Taxyl) xNa, however Tasl : Alignment measurement time amount Taxyl: Stage drive time amount Na : Suppose that each actuation (partial processing) of said wafer exchange, PURIARAIMENTO, etc. is called a term below the measurement shots per hour for alignment.
[0022] if the processing time (Et) is calculated -- a console CPU 331 -- next, termination prediction time of day (ET) is calculated from the time of day and the processing time (Et) on which said start button was pushed, and it displays on a display 102. If what contains an in-line conveyance system in a wafer conveyance system is assumed at this time, it is also possible to amend the wafer swap time Twl. If termination prediction time of day (ET) is displayed, lot processing will be started, and the time amount which each term took is recorded during lot processing.
[0023] After ending lot processing, a console CPU 331 searches for time difference (Dt) with the processing time (Et) predicted to be the actual processing time (Rt), and it judges whether the time difference was less than predetermined permissible time difference (Da). Here, permissible time difference (Da) sets up the allowed time for every term, and is computed based on them like the following formula.
Dt =Dwl+Dpl+Dal+(Del+(Dxyl+Dfl) xNs) xNe -- however Dwl: Wafer exchange allowed-time
Dpl:PURIARAIMENTO allowed time Dal: Alignment allowed time Del:exposure allowed time Dxyl : Stage drive allowed time Dfl: Focal allowed time Ns : Count Ne of a step : Exposure shots-per-hour alignment permissible time difference (Dal)=(Dasl+Daxyl) xNa, however Dasl : Alignment measurement allowed time Daxyl: Stage drive allowed time Na : Measurement shots per hour for alignment [0024] Here, when the difference of the processing time (Rt) and processing prediction time amount (Et) which were actually taken is larger than said permissible time difference (Da) (i.e., when it is |Rt-Et |>Da), the time difference of the processing prediction time amount and the processing time which actually started is searched for for every term, the term the time difference of whose was not less than permissible time difference of the term is specified, and it displays on a display 102. While an operator can know whether the throughput property which equipment originally has based on this display is demonstrated, when not demonstrating, he can grasp the whereabouts part of a fault factor based on the specified term.
[0025]
[Applicability of invention] In addition, although he is trying to search for the time difference of processing prediction time amount and the processing time which actually started in order to judge the existence of fault, you may make it search for the time difference of termination prediction time of day and actual end time in an above-mentioned example.
[0026] Moreover, in an above-mentioned example, assignment of processing object quantity and a setup of the processing time make it as operational as exposure processing unrelated always, and when these are operated, it may be made to make calculation and a display of processing prediction time amount etc. start, after performing assignment of wafer number of sheets, and a setup of the processing time and pushing a start button, but for said calculation means and a display means to carry out the processing. The command means for making the display of said prediction time amount or time of day perform furthermore at the time of arbitration may be established.

[0027] Furthermore, in ****, although the example which applied this invention to the aligner for mainly manufacturing a semi-conductor was shown, this invention may be applied to device manufacturing installations, such as an aligner for manufacturing the LCD panel, or semiconductor fabrication machines and equipment other than an aligner, the production line for manufacturing devices, such as these semi-conductors and the LCD panel, further, or down stream processing.

[0028]

[Effect of the Invention] This invention as mentioned above according to time difference with the lot processing time or termination prediction time of day predicted at the time of a lot processing start, the actually required processing time, or actual end time It diagnoses whether the throughput property which equipment and down stream processing originally have is demonstrated. When equipment or down stream processing does not demonstrate the throughput property which it originally has, which term (or partial processing) does not fulfill allowed time and by diagnosing and specifying a fault factor It has the effectiveness of contributing to early restoration from the early detection of fault and fault of equipment or down stream processing.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] About the equipment and the approach for manufacturing devices, such as a semiconductor device and the LCD panel, this invention computes especially the processing time or end time in a lot unit, and relates to the device manufacturing installation and approach of having been made to perform the self-test of equipment or a production process based on the difference with this, the actually required processing time, or end time.

[Translation done.]

.PRIOR ART

[Description of the Prior Art] The semi-conductor aligner which can be burned in a circuit pattern on a semi-conductor wafer, for example, a stepper, processes many wafers by the lot unit. At this time, exposure conditions, alignment conditions, etc. change with lots. Conventionally, the operator predicts the processing time and processing end time of this lot unit from the experience till then etc. Moreover, when a difference with this lot processing time, processing end time and the actual processing time, or processing end time was remarkable and large, the operator was checking by judging that abnormalities are in equipment.

[0003] However, since this processing time and processing end time change with an exposure parameter, the internal parameters of a stepper, etc., it is difficult for an operator to predict the exact processing time and processing end time. Especially, in Rhine of limited production with a wide variety, and prototype Rhine of a new product, since various lots are poured to one set of an aligner, the above troubles occur in many cases. Moreover, even when a difference with the predicted processing time, processing end time and the actual processing time, or processing end time was large, the difference had occurred where of processing of a lot, or the operator was not able to judge.

[0004] In addition, for these people, that an operator predicts the exact processing time and processing end time is a number-of-sheets assignment means to specify previously the number of sheets of the wafer of one lot which performs exposure processing, in view of a difficult point, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing, By providing a display means to display the value computed by this, the operator has applied for the semi-conductor aligner which enabled it to grasp the processing time and processing end time easily as Japanese Patent Application No. 6-297164.

[0005]

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] It diagnoses which term (or partial processing) as mentioned above, when the throughput " property that diagnose whether the throughput property which equipment and down stream processing originally have according to time difference with the lot processing time or the termination prediction time of day predicted at the time of a lot processing start, the actually required processing time, or actual end time is demonstrated by this invention, and originally equipment or down stream processing has it is not demonstrated, does not fulfill allowed time, and a fault factor is specified. Therefore, it has the effectiveness of contributing to early restoration from the early detection of fault and fault of equipment or down stream processing.

[Translation done.]

. TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention is a thing in consideration of the above-mentioned situation, and it aims at carrying out early detection of the fault of self-test Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. for actuation of down stream processing or equipment in the equipment for lot down stream processing or lot processing.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, in this invention, the end time of the time amount which the lot processing takes based on such specified processed material quantity and set-up processing-time information, or its lot processing computes by specifying the quantity of the processed material of one lot which should be processed by the lot processing before initiation of lot processing, and setting up the information on the processing time which each partial processing of this lot processing takes. And when it judges whether the difference with the computed processing time, end time and actual time amount, or time of day is settled in the fixed allowed value and settled in the fixed allowed value after termination of lot processing, it is characterized by judging with what had fault in the lot processing. Moreover, when fault is in said lot processing, it is characterized by specifying the partial processing to which the actual processing time is compared with the processing time set up or computed beforehand, and the difference has exceeded tolerance for each [which constitutes the lot processing if needed] the partial processing of every as a fault part.

[Translation done.]

.OPERATION

[Fuñction] According to the above-mentioned configuration, the information on the processing time which each partial processing of the lot processing takes can be set up before initiation of lot processing, the end time of the time amount which the lot processing takes by specifying the quantity of the processed material of one lot which should be processed by the lot processing, or its lot processing can be computed, and an operator etc. can know easily the exact processing time and the end time of processing.

[0008] And by judging the case where the time difference is not settled in the fixed allowed value after termination of lot processing in quest of time difference with the computed processing time, end time and actual time amount, or time of day to be what had fault in the lot processing, even if it is the operator who does not gain experience, the quality of lot processing can be judged easily. Furthermore, the partial processing which is a fault part can be easily specified by searching the partial processing to which the actual processing time is compared with the processing time set up or computed beforehand, and the difference has exceeded tolerance for each [which constitutes the lot processing] the partial processing of every.

[0009] In the desirable example of this invention, the above-mentioned configuration is applied to for example, a semi-conductor aligner. This semi-conductor aligner is a number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing, A comparison means [predetermined allowed time / time difference / of the processing time or the actual exposure processing end time which this exposure processing actually took after termination of said exposure processing, and the value computed by said calculation means], A fault part specification means to search for the difference of the processing prediction time amount and the actual processing time for said every partial processing, and to specify the partial processing which was the fault of processing about it as compared with the predetermined allowed value when said time difference exceeds predetermined allowed time, Said fault part is displayed. A display means is provided.

[0010] Said setting means is equipped with a storage means by which said processing-time information according to the class of exposure processing is memorized, a class assignment means to specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means. Said calculation means computes the processing prediction time amount and termination prediction time of day of a lot based on the processing-time information read from said storage means according to information and such information, such as a specified exposure parameter, an interior parameter of a stepper, and processing wafer number of sheets. Said display means displays said time amount or time of day at the time of the start of exposure processing of said one lot.

[0011] In case exposure processing is performed using an aligner, in order to display the time amount which exposure processing of one lot takes, or the end time of the processing, the number of sheets of the processing wafer of one lot is specified with a number-of-sheets assignment means, and processing-time information is set up with a setting means. This processing-time information is exposure parameters and the interior parameters of a stepper, such as the exposure time and a count of a step, and usually changes with lots with which exposure conditions differ. Therefore, by making into a job name etc. the class of exposure specifically applied to the lot, a setup of processing-time information is specified with a class assignment means, and is performed by reading the processing-time information corresponding to the specified job name from a storage means. A calculation means computes the time amount (processing prediction time amount) which exposure processing of one lot takes based on those wafer number of sheets and processing-time information, or the end time (termination prediction time of day) of the processing, and a display means displays the value. The processing prediction time amount and termination prediction time of day which were displayed are easily recognized by the operator, and efficient employment of equipment is presented with them.

[0012] A comparison means judges whether time difference with the processing prediction time amount found with said calculation means, termination prediction time of day and the actual processing time, or end time is settled in predetermined tolerance after termination of exposure processing of one lot. When it is judged that said comparison means is not settled, a fault part specification means investigates where the time difference has occurred, pinpoints the part, and is made to display it on a display means. An operator can do easily pinpointing of a fault part when there are the existence of fault and fault in exposure processing from the display after exposure processing termination.

[0013] Therefore, this invention demonstrates the following effectiveness from a viewpoint of the early detection of the manufacturing installation of a production line, or the fault of a process, and improvement in an operating ratio.

** Since the termination prediction time of day of each lot and actual end time can be managed when pouring two or more lots with two or more equipments, each equipment or a process can confirm whether to demonstrate the equipment or the throughput engine performance of process original. Therefore, in the former, it contributes to the early detection of the fault of the equipment or the process which tended to be overlooked.
** In the above-mentioned check, when the equipment or process does not demonstrate the original throughput engine performance, it can specify which processing causes a throughput fall by processing of a lot, and it can be shown to an operator. Therefore, pinpointing of equipment or the fault part of a process becomes early, and contributes to improvement in equipment or a process operating ratio. It is used for forming the plan of equipment management easily so that assistance (carrier exchange etc.) of an operator may not be needed.

[Translation done.]

.EXAMPLE

[Exàmple] Hereafter, this invention is more concretely explained through an example. Drawing 1 is the perspective view showing the appearance of the semi-conductor aligner concerning one example of this invention. As shown in this drawing, this semi-conductor aligner is arranged to the temperature control chamber 101 which performs environmental temperature control of the body of equipment, and its interior. In the EWS body 106 and row which have CPU which controls the body of equipment In the display unit 102 for EWS and the body of equipment which display the predetermined information in equipment It has the console section containing the control panel 103 for performing a predetermined input to the monitor TV 105 which displays the image information obtained through an image pick-up means, and equipment, and the keyboard 104 grade for EWS. For an emergency stop switch and 109, as for a LAN telecommunication cable and 111, 110, such as various switches and a mouse, is [107 / an ON-OFF switch and 108 / the jet pipe of generation of heat from a console function and 112] the exhausters of a chamber among drawing. The body of a semi-conductor aligner is installed in the interior of a chamber 101.

[0015] The display 102 for EWS is a thing thin flat type [, such as EL, plasma, and liquid crystal,], is dedicated to chamber 101 front face, and is connected with the EWS body 106 by the LAN cable 110. A control panel 103, a keyboard 104, and monitor TV105 grade are also installed in chamber 101 front face, and enable it to have performed the same console actuation as usual from chamber 101 front face.

[0016] Drawing 2 is drawing showing the internal structure of the equipment of drawing 1 . The stepper as a semi-conductor aligner is shown in this drawing. Among drawing, a reticle and 203 are wafers, and 202 can imprint the pattern on a reticle 202 in the sensitization layer on a wafer 203 with the projection lens 206, when the flux of light which came out of light equipment 204 illuminates a reticle 202 through the illumination-light study system 205. The reticle 202 is supported by the reticle stage 207 for holding a reticle 202 and moving. A wafer 203 is exposed after vacuum adsorption has been carried out by the wafer chuck 291. The wafer chuck 291 is movable to each shaft orientations by the wafer stage 209. The reticle optical system 281 for detecting the amount of location gaps of a reticle is arranged at the reticle 202 bottom. The projection lens 206 is adjoined above the wafer stage 209, and the off axis microscope 282 is arranged. It is a main role that the off axis microscope 282 performs relative-position detection with an internal reference mark and the alignment mark on a wafer 203. Moreover, these stepper body is adjoined, the reticle library 220 and the wafer carrier elevator 230 which are a peripheral device are arranged, and a required reticle and a required wafer are conveyed by the reticle transport device 221 and the wafer transport device 231 at a stepper body.

[0017] The chamber 101 consists of a filter box 213 which filters the air-conditioning cabin 210 and minute foreign matter which mainly perform temperature control of air, and forms the uniform flow of clarification air, and a booth 214 which intercepts an equipment environment with the exterior. Within a chamber 101, the air by which temperature control was carried out at the condensator 215 and the reheat heater 216 in the air-conditioning cabin 210 is supplied in a booth 214 through an air filter g by the blower 217. From the return opening ra, the air supplied to this booth 214 is incorporated again in the air-conditioning cabin 210, and circulates through the inside of a chamber 101. Usually, strictly, this chamber 101 has introduced the air outside the booth 214 of about ten percent of circulating air volume through a blower from the open air inlet oa in which it was prepared in the air-conditioning cabin 210 in order to always maintain the inside of not the perfect circulatory system but the booth 214 at positive pressure. Thus, it makes it possible for a chamber 101 to keep constant the environmental temperature on which this equipment is put, and to maintain air at clarification. Moreover, in preparation for cooling of an ultrahigh pressure mercury lamp, or toxic gas generating at the time of laser abnormalities, Inlet sa and an exhaust port ea are established in light equipment 204, and the forcible exhaust air of a part of air in a booth 214 is carried out via light equipment 204 at the plant through the ventilating fan of the dedication with which the air-conditioning cabin 210 was equipped. Moreover, it connected with the open air inlet oa and the return opening ra of the air-conditioning cabin 210, respectively, and they are equipped with the chemisorption filter cf for removing the chemical in air.

[0018] Drawing 3 is the block diagram showing the electrical circuit configuration of the equipment of drawing 1 . In this drawing, 321 is the body CPU which manages control of the whole equipment and which was built in said EWS body 106, and consists of arithmetic and program control, such as a microcomputer or a minicomputer. 322 -- for a reticle stage driving gear and 325, as for a shutter driving gear and 327, the illumination system of said light equipment 204 grade and 326 are [a wafer stage driving gear and 323 / the alignment detection system of said off axis microscope 282 grade, and 324 / a focal detection system and 328] Z driving gears, and these are controlled by the body CPU 321. 329 is the conveyance system of said reticle transport device 221 and wafer transport-device 231 grade. 330 is a console unit and has the start button which is not illustrated for ordering it the control panel 103 for giving various kinds of commands and parameters about actuation of this aligner to said display 102 and a body CPU 321, a keyboard

104, a non-illustrated mouse, and initiation of exposure processing. Namely, a console unit 330 is for delivering and receiving information among operators. And a number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing by which it is characterized [of this invention], A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means and said setting means, or the end time of the processing, and a display means to display the value computed by this are constituted.
[0019] It is external memory 331 remembers Console CPU and 332 remembers a parameter etc. to be. It is a hard disk and external memory 331 has memorized the processing-time information for every partial processing according to data required for exposure, or the class of exposure processing as a job file.
[0020] Drawing 4 is a flow chart which shows actuation of this equipment. When performing exposure processing of one lot, as shown in drawing 4 , an operator specifies the job file first applied to processing of the lot by the control units (a control panel, a keyboard 104, mouse that is not illustrated) of a console unit 330, specifies the wafer number of sheets processed with the lot, and pushes said start button after an appropriate time.
[0021] Then, a console CPU 331 reads the various parameters memorized by the specified job file and the need parameter inside a stepper, and calculates the processing time (Et) of a lot by the following formula.
Processing time (Et) = wafer (number-of-sheets W) x index time (It)
Said index time (It) is called for by the degree type.
It =Twl+Tpl+Tal +(Tel+(Txyl+Tfl) xNs) xNe, however Twl:wafer swap time Tpl:PURIARAIMENTO Tal:alignment time amount Tel : exposure time Txyl : Stage drive time amount Tfl: Focal time amount Ns : Count Ne of a step : An exposure shots-per-hour pan is asked for said alignment time amount Tal by the following formula.
Alignment time amount (Tal)=(Tasl+Taxyl) xNa, however Tasl : Alignment measurement time amount Taxyl: Stage drive time amount Na : Suppose that each actuation (partial processing) of said wafer exchange, PURIARAIMENTO, etc. is called a term below the measurement shots per hour for alignment.
[0022] if the processing time (Et) is calculated -- a console CPU 331 -- next, termination prediction time of day (ET) is calculated from the time of day and the processing time (Et) on which said start button was pushed, and it displays on a display 102. If what contains an in-line conveyance system in a wafer conveyance system is assumed at this time, it is also possible to amend the wafer swap time Twl. If termination prediction time of day (ET) is displayed, lot processing will be started, and the time amount which each term took is recorded during lot processing.
[0023] After ending lot processing, a console CPU 331 searches for time difference (Dt) with the processing time (Et) predicted to be the actual processing time (Rt), and it judges whether the time difference was less than predetermined permissible time difference (Da). Here, permissible time difference (Da) sets up the allowed time for every term, and is computed based on them like the following formula.
Dt =Dwl+Dpl+Dal+(Del+(Dxyl+Dfl) xNs) xNe -- however Dwl: Wafer exchange allowed-time Dpl:PURIARAIMENTO allowed time Dal: Alignment allowed time Del:exposure allowed time Dxyl : Stage drive allowed time Dfl: Focal allowed time Ns : Count Ne of a step : Exposure shots-per-hour alignment permissible time difference (Dal)=(Dasl+Daxyl) xNa, however Dasl : Alignment measurement allowed time Daxyl: Stage drive allowed time Na : Measurement shots per hour for alignment [0024] Here, when the difference of the processing time (Rt) and processing prediction time amount (Et) which were actually taken is larger than said permissible time difference (Da) (i.e., when it is |Rt-Et |>Da), the time difference of the processing prediction time amount and the processing time which actually started is searched for for every term, the term the time difference of whose was not less than permissible time difference of the term is specified, and it displays on a display 102. While an operator can know whether the throughput property which equipment originally has based on this display is demonstrated, when not demonstrating, he can grasp the whereabouts part of a fault factor based on the specified term.
[0025]
[Applicability of invention] In addition, although he is trying to search for the time difference of processing prediction time amount and the processing time which actually started in order to judge the existence of fault, you may make it search for the time difference of termination prediction time of day and actual end time in an above-mentioned example.
[0026] Moreover, in an above-mentioned example, assignment of processing object quantity and a setup of the processing time make it as operational as exposure processing unrelated always, and when these are operated, it may be made to make calculation and a display of processing prediction time amount etc. start, after performing assignment of wafer number of sheets, and a setup of the processing time and pushing a start button, but for said calculation means and a display means to carry out the processing. The command means for making the display of said prediction time

amount or time of day perform furthermore at the time of arbitration may be established.

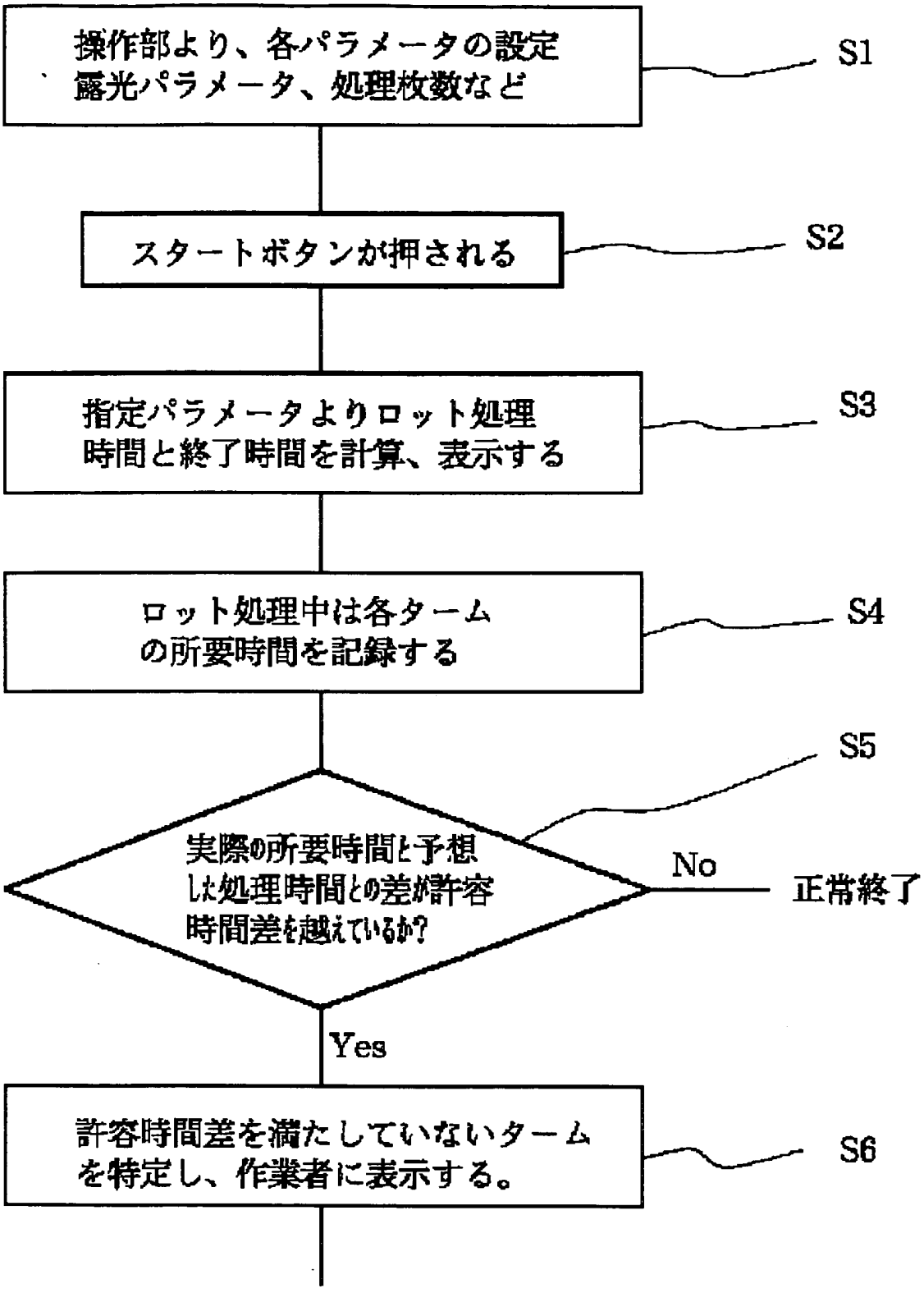
[0027] Furthermore, in ****, although the example which applied this invention to the aligner for mainly manufacturing a semi-conductor was shown, this invention may be applied to device manufacturing installations, such as an aligner for manufacturing the LCD panel, or semiconductor fabrication machines and equipment other than an aligner, the production line for manufacturing devices, such as these semi-conductors and the LCD panel, further, or down stream processing.

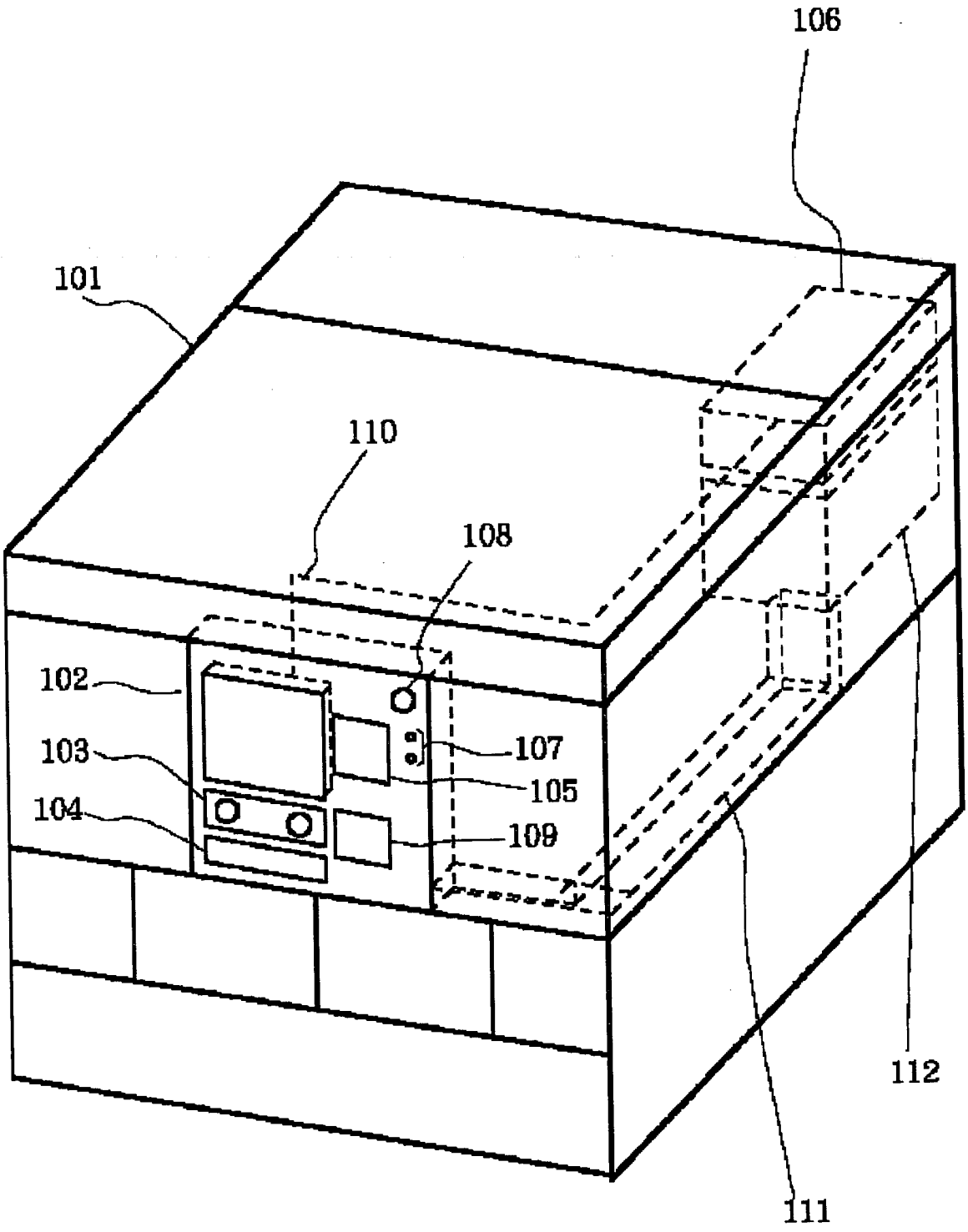
[Translation done.]

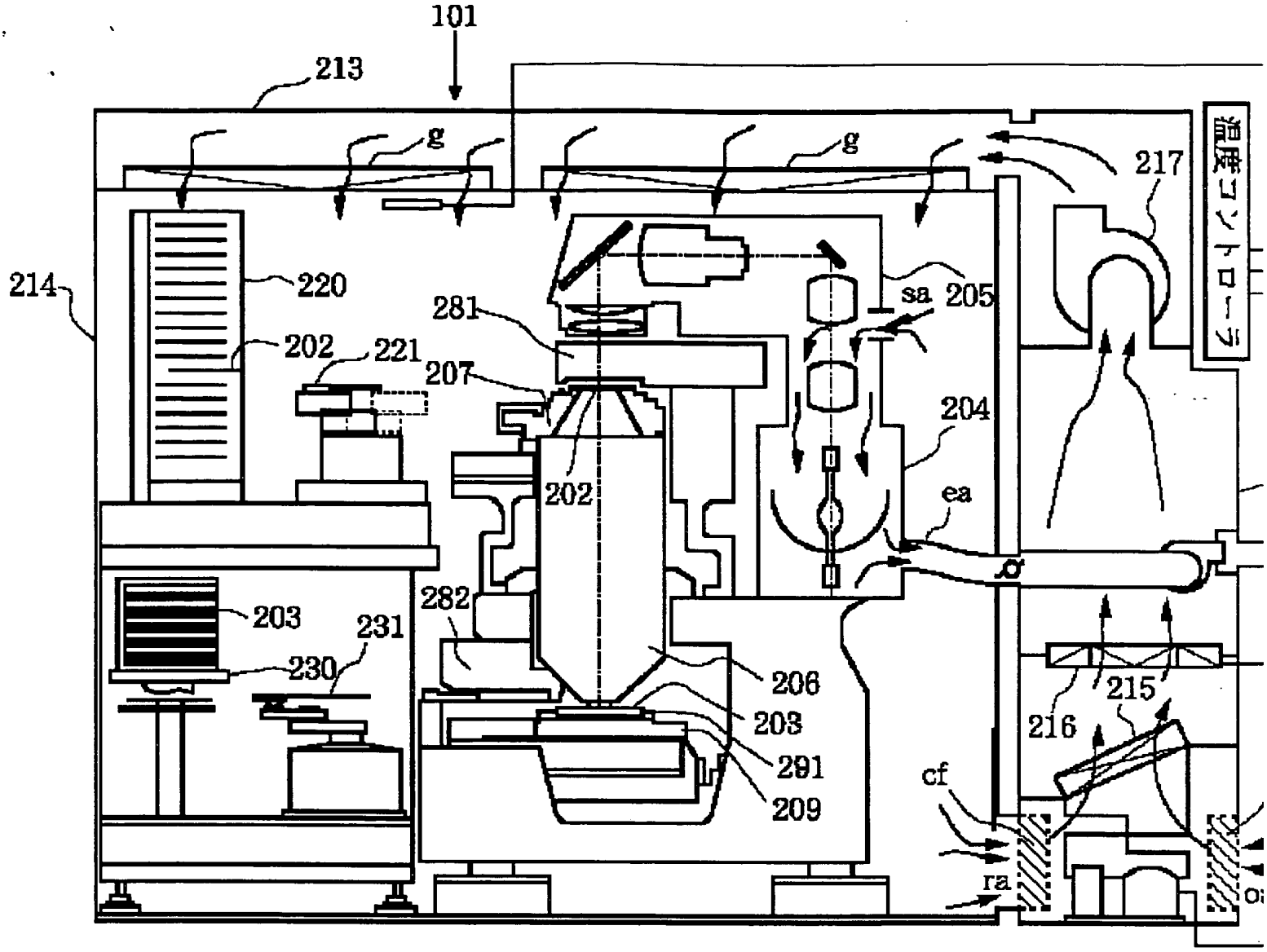
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view showing the appearance of the semi-conductor aligner concerning one example of this invention.
[Drawing 2] It is drawing showing the internal structure of the equipment of drawing 1 .
[Drawing 3] It is the block diagram showing the electrical circuit configuration of the equipment of drawing 1 .
[Drawing 4] It is the flow chart which shows actuation of the equipment of drawing 1 .
[Description of Notations]
A temperature control chamber, the display unit for 102:EWS, 103 : 101: A control panel, 104: The keyboard for EWS, 105 : Monitor TV, a 106:EWS body, 107: An ON-OFF switch, a 108:emergency stop switch, 109 : Various switches, A 110:LAN telecommunication cable and 111:jet pipes, such as a mouse, 112 : An exhauster, 202 : A reticle, a 203:wafer, 204:light equipment, a 205:illumination-light study system, 206: A projection lens, a 207:reticle stage, 209 : A wafer stage, 281: A reticle microscope, a 282:off axis microscope, 210 : An air-conditioning cabin, 213: -- a filter box and 214: -- a booth, a 217:blower, g:air filter, cf:chemisorption filter, oa:open air inlet, and ra: -- return opening, the 321:body CPU, a 330:console, the 331:console CPU, and 332:external memory.

[Translation done.]


操作部より、各パラメータの設定
露光パラメータ、処理枚数など
S1
スタートボタンが押される
S2
指定パラメータよりロット処理
時間と終了時間を計算、表示する
S3
ロット処理中は各タームの所要時間を記録する
S4
S5
実際の所要時間と予想した処理時間との差が許容時間差を越えているか?
No
正常終了
Yes
許容時間差を満たしていないタームを特定し、作業者に表示する。
S6


106
101
110
108
102
103
104
107
105
109
112
111


101
213
g
g
217
温度コントローラ
214
220
281
sa
205
202
221
207
204
202
ea
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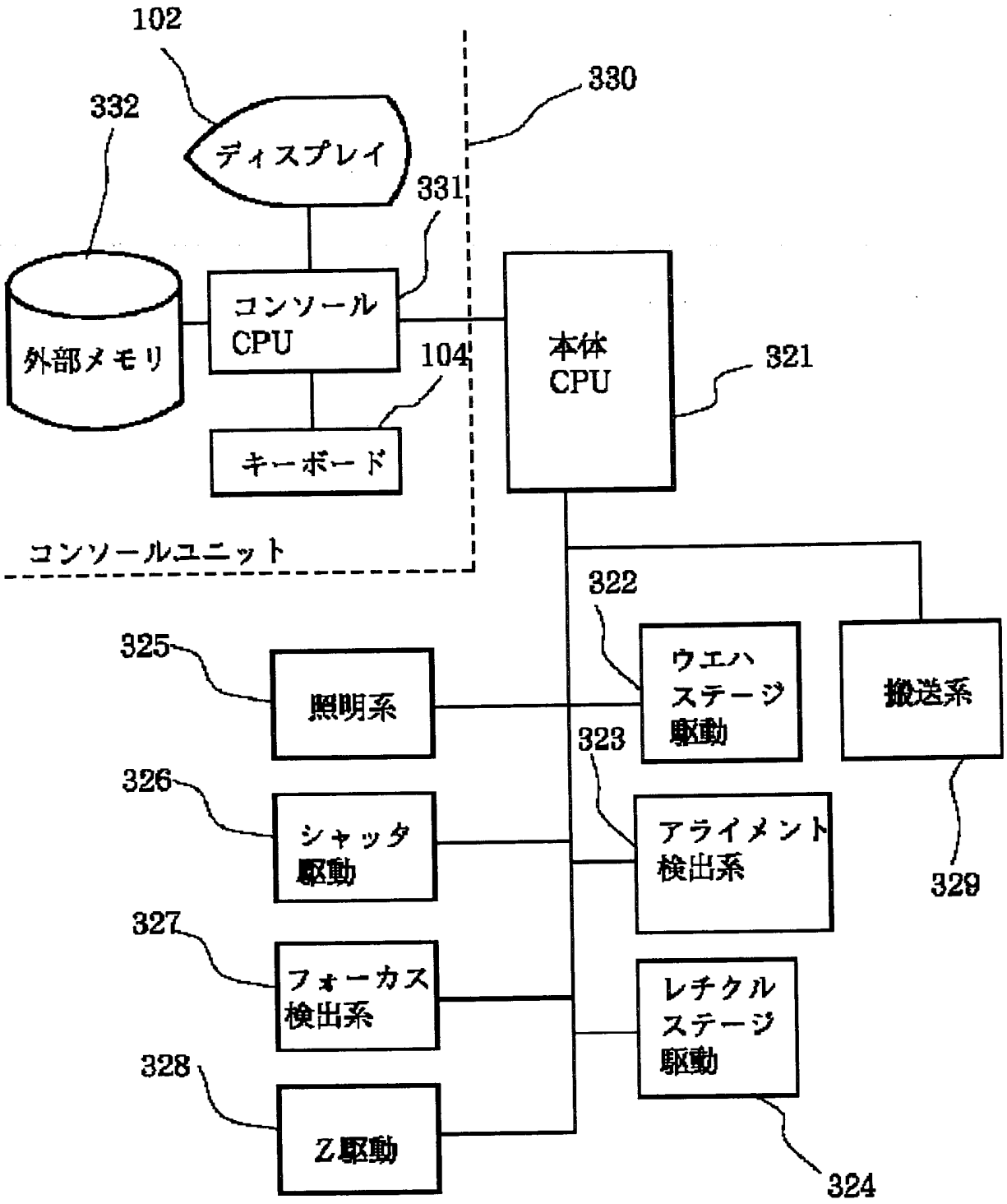
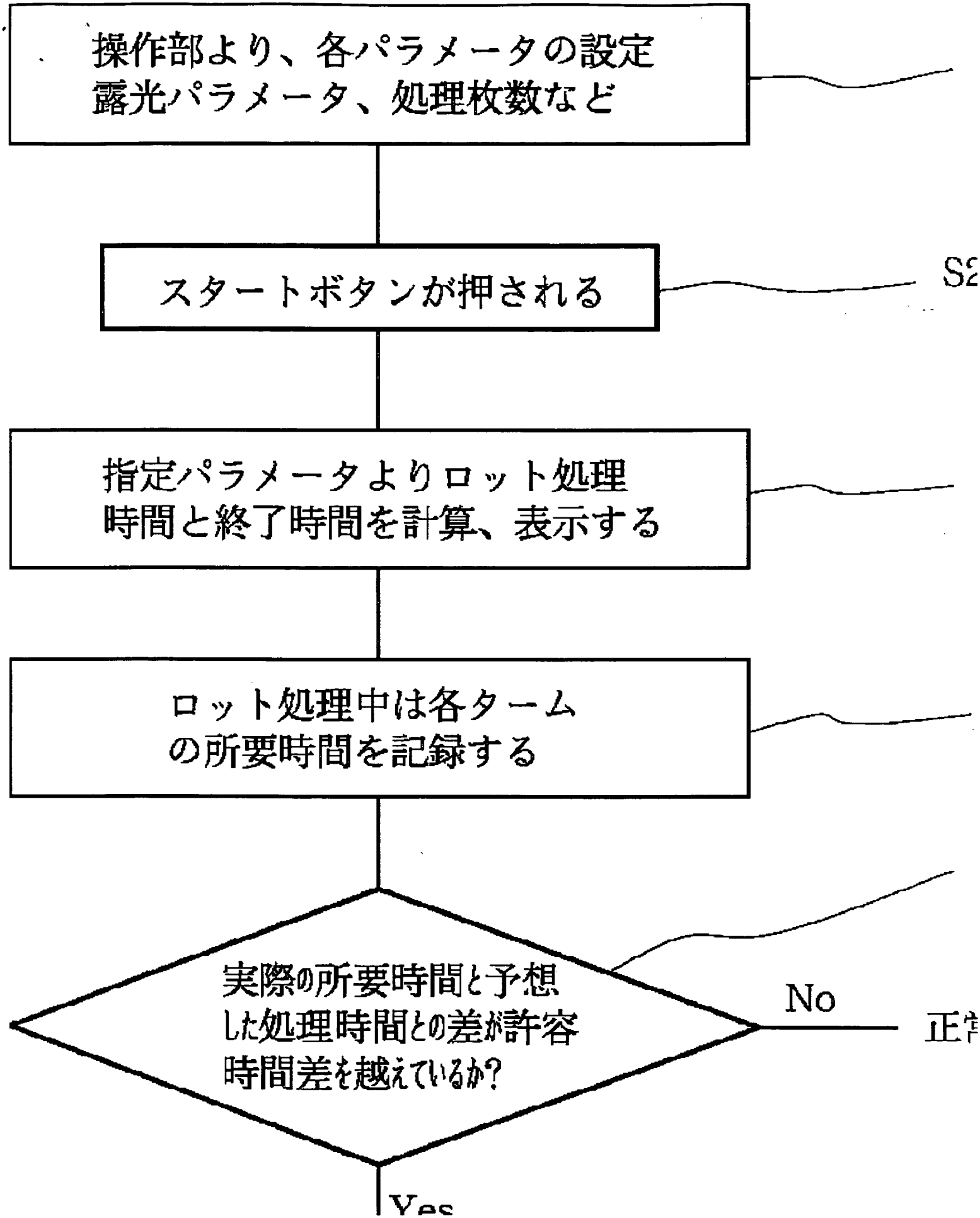
282
230
206
203
291
209
215
216
cf
ra


102
330
332
ディスプレイ
331
外部メモリ
コンソール
CPU
本体
CPU
321
104
キーボード
コンソールユニット
322
325
照明系
ウエハ
ステージ
駆動
搬送系
323
326
シャッタ
駆動
アライメント
検出系
329
327
フォーカス
検出系
レチクル
ステージ
駆動
328
Z駆動
324


操作部より、各パラメータの設定
露光パラメータ、処理枚数など
スタートボタンが押される
S2
指定パラメータよりロット処理
時間と終了時間を計算、表示する
ロット処理中は各ターム
の所要時間を記録する
実際の所要時間と予想
した処理時間との差が許容
時間差を越えているか?
No
正
Yes